

Citigroup & NYSERDA FlexTech Project

The Virtual Facility powered by engineering simulation



Citigroup utilized the Virtual Facility (VF) from Future Facilities to improve their NYC data center's efficiency, uncovering potential savings of over \$290,000 annually. With an initial investment of just \$28,500 for remediation, the project is expected to see a full ROI in 6 months. Powered by engineering simulation, the VF allowed Citigroup to simulate and predict the impact of any change – removing uncertainty in the decision-making process and laying the groundwork for the VF to be fully integrated into their workflow.

Citigroup & NYSERDA

Partnering with New York State Energy Research and Development Authority (NYSERDA), Citigroup began the process of improving component and system-level efficiency in their space-tapped, 40,000 ft², 1986 legacy data center. They received funding from NYSERDA's FlexTech program to improve energy efficiency using the VF, an engineering simulation tool offered in the 6SigmaDCX software suite.

After a comprehensive site audit and VF analysis, Citigroup used The Green Grid's Performance Indicator (PI) to quantify and evaluate their data center's performance. The facility's IT thermal compliance, space utilization, and year-averaged PUE were used to calculate a baseline PI for the facility.

	PUEr(C)[%]	IT Thermal Conformance [%]	IT Thermal Resilience [%]	% Load
Aspirational Performance	82.8	100.0	100.0	100.0
Baseline Performance	75.0	90.8	95.1	54.7

Table 1: Comparison of aspirational and baseline performance

Citigroup's objective for this project was to achieve cost savings by reducing the energy consumption of their HVAC system. However, as a mission critical facility, they had to first ensure 100% IT Thermal Conformance and 100% IT Thermal Resilience for their assets.

The VF allowed Citigroup to pursue remediation with full visibility into the immediate impact on IT thermal compliance. Moving forward, this visibility will allow them to safely continue with their IT growth plan.

Optimizations in Detail

Citigroup used the engineering simulation results to find and fix a range of issues in the facility, which were primarily within the cabinets. For example, in several of the facility's network cabinets, simulation results showed IT exhaust flow directly feeding into the inflows of neighboring IT (figure 1), raising equipment inlet temperatures and contributing to the facility's thermal compliance issues.

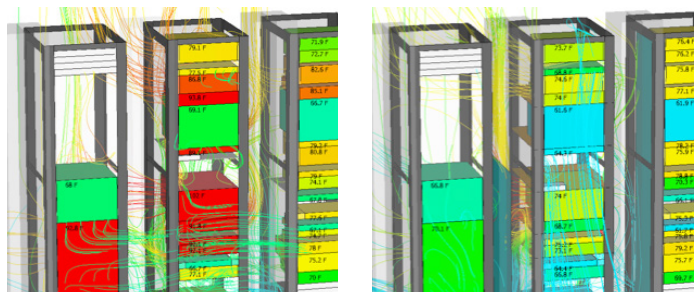


Figure 1: (Left) IT exhaust flow can be seen feeding into neighboring IT inflows, raising their inlet temperatures. (Right) The new blanking system prevents this from occurring.

Citigroup designed and simulated custom blanking solutions to prevent recirculation in their network cabinets. The VF pinpointed the worst performing cases, where remediation efforts would have the biggest impact. This prevented over-engineering and blanket solutions, which kept remediation costs down.

The designed solutions reduced inlet temperatures by 27%. Without the visibility provided by simulation, it would have been impossible to arrive at such an optimal and low-cost solution within such a short timeframe. Remediations like these allowed all cabinets in the facility to fall within the ASHRAE allowable and recommended temperature ranges (figure 2).

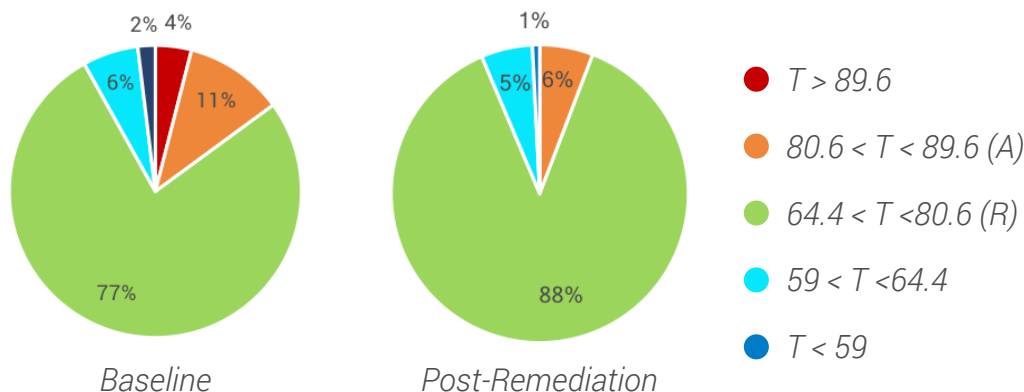
"The holy grail is to have this be a regular part of our processes"



"Engineering simulation was especially attractive to us because...often what you're expecting to see as a result [in a data center], you don't always get. Simulation was a really good interim step for us to understand the impact of doing something we wanted to do."

Christian Pastrana, VP Data Center Planning at Citigroup

Figure 2: (Left) Before remediation, 4% of the facility's cabinets were operating at temperatures above ASHRAE's guidelines. (Right) Post-remediation, all cabinets in the facility are operating below ASHRAE's allowable temperature limit.



Results

Post-remediation, the data center secured 100% Thermal Conformance and Resilience, thus meeting Citigroup's objectives. The PUEr score was improved to be within 1% of The Green Grid's suggested range of compliance, and additional HVAC system savings were unlocked for facility cooling loads beyond the data center. Substantial energy savings were made achievable without risk to the facility's Thermal Conformance or Resilience.

Citigroup's economic analysis estimated that the facility's remediation efforts resulted in a over \$290,000 in potential annual energy savings. With an estimated total cost of \$28,500 for the remediation plan, the project is expected to see an ROI in 6 months (not including FlexTech funding) after implementation.

In the future, Citigroup plans to implement 6SigmaDCX and utilize VF models across their data

center portfolio. The software's integrations with a wide range of asset management and DCIM tools will expedite this process, allowing Citigroup to utilize their existing data for faster VF model building and calibration. They can then rely on engineering simulation to optimize cooling performance and realize further cost and energy savings throughout their global facilities.

	PUEr(C)[%]	IT Thermal Conformance [%]	IT Thermal Resilience [%]	% Load
Aspirational Performance	82.8	100.0	100.0	100.0
Baseline Performance	75.0	90.8	95.1	54.7
Post-Remediation	81.8	100.0	100.0	54.7

Table 2: Comparison of aspirational, baseline and post-remediation performance.



The New York State Energy Research and Development Authority (NYSERDA) provides objective analysis and technical expertise on energy efficiency and renewable energy. The NYSEDA FlexTech program helps businesses identify and prioritize energy-saving opportunities in data centers through energy studies, modeling, and simulation.